Australian Bureau of Statistics

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Summary

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Methodological News contains articles on a range of topics from across different areas within the Methodology Division in the ABS. This issue there are two articles describing research presented at the most recent Methodology Advisory Committee, one on research into methods for balancing tables and the other on new weighting methods.

Quadratic Optimisation for Table Balancing in Official Statistics

QUADRATIC OPTIMISATION FOR TABLE BALANCING IN OFFICIAL STATISTICS

ABS and our international counterparts often encounter the problem of adjusting tables or time series of data to achieve internal consistency. For example, National Accounts and other statistical outputs frequently require "balancing" or "benchmarking": adjusting estimates to satisfy internal consistency constraints and/or to reconcile information from multiple sources. This balancing must be done in a way that avoids excessive changes to the data.

In recent years, several agencies have adopted a weighted-least-squares (WLS) method for table balancing, with ABS now looking to do the same. This approach relies on defining an "objective function" that measures the overall impact of adjustments to the data, both in terms of point-in-time estimates and in year-to-year movements, and then finding the balanced solution that minimises this objective - this may be thought of as the least disruptive adjustment possible, under the balancing constraints specified.

The objective function may reflect our knowledge about the quality of the inputs. For example, we may be more willing to accept large adjustments to one component of the table if its source is considered less reliable, and this is reflected in an objective function that makes that component cheaper to adjust relative to others deemed more reliable. One published approach is to construct multiple objective functions, each designed for a specific purpose, and then add these together to create an overall objective.

Current implementations of these methods require a subjective approach to weighting and to the form of the objective function. It is not always clear what the best choices might be, and different agencies have adopted different approaches.

ABS Methodology Advisory Committee (MAC) Paper #157 presents a theoretical framework that may allow a more objective approach to these questions. It shows that simple WLS objective functions are equivalent to maximum likelihood estimators (MLEs) under certain assumptions about the nature of measurement errors. This interpretation suggests a less subjective approach to setting weights, one that may be largely automated if given sufficient input data. It also implies that the approach of adding objective functions together may not be ideal, and offers an alternate way to handle this problem: it may be preferable to create a combined error model and then construct a single MLE-based objective function corresponding to this model.

Further Information
For more information, please contact Geoffrey Brent (methodology@abs.gov.au).

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Weighting Technology for Transformed Systems

WEIGHTING TECHNOLOGY FOR TRANSFORMED SYSTEMS

The Methodology Futures Section has a leadership role in developing methodologies that will be required for the ABS Transformation agenda. One area of development over 2015/16 has been identifying estimation approaches that can reproduce or improve on current methods, while being straightforward to build into systems. This work resulted in a paper presented to the Methodology Advisory Committee on 1 July 2016 entitled "Weighting Technology for Transformed Systems".

The paper focuses on methods that use the well-established Generalised Regression (GREG) approach and that provide estimates as a weighted sum of the survey units. It presents some novel uses of the GREG approach in survey estimation. One example is estimating multiple integrated or modular surveys at the same time in such a way that each survey gives the same estimates for a set of core items. This gives each core item estimate a lower sampling error than would have been obtained from any of the surveys alone. Other examples in the paper include composite estimation, in a form applicable to a variety of continuing surveys where correlations between time points are substantial; and pooling of data over multiple time points to produce more stable estimates.

The versatility of the GREG approach makes it ideal for use in new systems. In 2016/17, Methodology Futures staff are contributing to the building of an Output Estimation capability as members of an Agile team in the Statistical Business Transformation Program.

Further Information
For more information, please contact Philip Bell (methodology@abs.gov.au).

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HOW TO CONTACT US AND EMAIL SUBSCRIBER LIST

Methodological News features articles and developments in relation to methodology work done within the ABS Methodology Division. By its nature, the work of the Division brings it into contact with virtually every other area of the ABS. Because of this, the newsletter is a way of letting all areas of the ABS know of some of the issues we are working on and help information flow. We hope the Methodological Newsletter is useful and we welcome comments.

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About this Release

The Methodological News is a quarterly information bulletin from the Methodology and Data Management Division. The newsletter features articles and developments in relation to work done with the division.

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